

REMARKS

Applicants have carefully considered the July 2, 2009 Office Action, and the amendments above together with the comments that follow are presented in a bona fide effort to address all issues raised in that Action and thereby place this case in condition for allowance.

Claims 1-3 and 5-20 are pending in this application. Claims 17-20 have been withdrawn from consideration pursuant to the provisions of 37 C.F.R. § 1.142(b). Claim 1 has been amended. No new matter has been entered. Support for the amendment can be found in paragraph [0052] of the published version of the present application. Entry of the present response is respectfully solicited. It is believed that this response places this case in condition for allowance. Hence, prompt favorable reconsideration of this case is solicited.

The Examiner is respectfully requested to expressly consider the Information Disclosure Statement submitted on September 23, 2009 and make of record the references cited on the PTO-1449. The Examiner is requested to forward a properly initialed copy of the PTO-1449 with the next Office action.

Claims 1-3, 5-8, 14 and 16 were rejected under 35 U.S.C. § 103(a) as being obvious over Phillips et al. (U.S. Pat. No. 5,571,615, hereinafter "Phillips") in view of Fontaine et al, *Tribochemistry Between Hydrogen and Diamond-Like Carbon Films*, Surface and Coatings Technology 146-147 (2001) 286-291 (hereinafter "Fontaine"). Applicants traverse.

Claim 1, as presently amended, describes that the diamond coating of the present subject matter has a double crystal structure which is now defined as "primary diamond fine grains" and "secondary diamond grains." Said differently, the diamond coating of the present claimed

subject matter is formed of diamond grains (secondary grains) and each of the diamond grains is further formed of diamond fine grains (primary grains). Thus, it is believed that the present claims are commensurate in scope and are patentably distinct over the art of record for the reasons advocated below.

There are arguably processing conditions which are common between the present application and the invention of Phillips. However, Applicants emphasize that there are conditions that are distinctively different, such as whether or not there is a carburization step (discussed further below). Such differences of processing conditions make obvious differences in the crystal structure of the diamond coating of the present subject matter and that of Phillips, in particular, the results of the Raman spectroscopic analysis. Differences in the crystal structure in light of the spectroscopic analysis have been acknowledged by the Examiner at page 6 of the latest Office Action. Applicants submit that in view of the fact that the crystal structure of the diamond coating of Phillips does not remotely resemble that of the present claimed subject matter, one of ordinary skill in the art would not have found it obvious to conceive the present claimed subject matter.

Applicants submit that Phillips merely shows elongated diamond grains that extend from a substrate to a surface of a diamond coating in Figure 4 and Phillips neither teaches nor remotely suggests that these diamond grains are further formed of diamond fine grains. Thus, the structure of the diamond coating of Phillips can be restated simply as "a single crystal structure." The result of Raman spectroscopic analysis most obviously shows a difference between the crystal structure of the diamond coating of the present subject matter and that of

Phillips. The result of Raman spectroscopic analysis on the diamond coating of the present subject matter shows a local peak in the vicinity of $1100\sim 1150\text{ cm}^{-1}$. See FIGS. 9 and 10 of the present specification. This peak is one of physical values specifying a "double crystal structure." By contrast, the result of Raman spectroscopic analysis on the diamond coating of Phillips does not show a data in the vicinity of $1100\sim 1150\text{ cm}^{-1}$. See FIG. 5 of Phillips. This is probably due to the fact that a distinctive peak does not exist in the vicinity.

The significance of Raman spectroscopic analysis is now explained. Applicants performed a test to demonstrate that a difference of crystal structure is reflected in a result of Raman spectroscopic analysis. Since Phillips does not teach a producing condition in detail, a diamond coating is formed under a condition adjusted so as to obtain a result which is similar to the result shown in FIG. 5 of Phillips. FIG. 1, reproduced below, is a graph showing a result of Raman spectroscopic analysis of a diamond coating obtained in the test. FIG. 2, also reproduced below, is a SEM photograph showing a cross-sectional surface of the same diamond coating.

FIG. 1

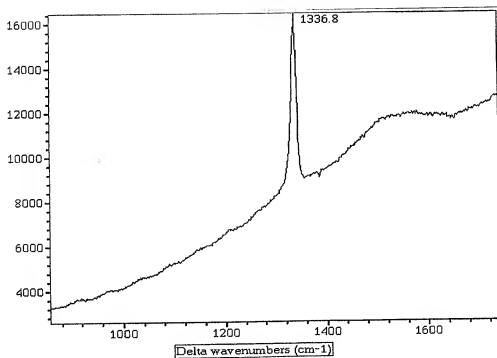
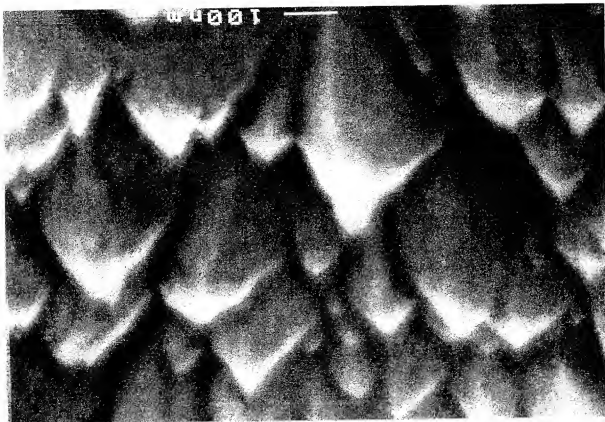


FIG. 2



Referring to FIG. 1 above, while there is a peak in the vicinity of 1330 cm^{-1} , a local peak does not appear in the vicinity of $1100\sim 1150\text{ cm}^{-1}$, unlike FIGS. 9 and 10 of the present application. This experimental result indicates that the diamond coating produced in the test has a crystal structure similar to that described in the Phillips patent.

Turning attention to FIG. 2 above, the SEM photograph has a scale of nanometer order, that is, FIG. 2 shows an enlarged equivalent of diamond grains of the diamond coating shown in FIG. 4 (micrometer order) of Phillips.

Moreover, FIG. 2 (above) has the same scale as FIG. 7 of the present application (a SEM photograph showing diamond fine grains of the present subject matter). Therefore, by observing FIG. 2 (above) and FIG. 7 of the present application, a comparison of the crystal structure can be made between the diamond coating of Phillips and that of the present claimed subject matter. In fact, the differences are readily apparent when these two figures are compared. More importantly, it is clear that the diamond coatings of Phillips and the present application are totally different in terms of their crystal structure.

Phillips discloses a carbide substrate coated with a diamond film and the diamond film has a thickness of greater than about 10 microns and a grain size of less than about 0.5 microns. The diamond film of Phillips merely has a single crystal structure which is totally distinct from the claimed diamond coating which is an aggregate of secondary diamond grains, each of which includes an aggregate of primary diamond fine grains.

Furthermore, as described in the present application, the surface of the substrate is carburized before it is coated with a diamond coating by a CVD method. The carburization is an indispensable process as indicated by the result of Embodiment 1. In contrast, Phillips only teaches that the diamond film is formed by a CVD method. Phillips does not teach or remotely suggest anything about carburization before coating or conditions such as a pressure of an atmosphere for a diamond coating process. Accordingly, it is hardly possible that the diamond film of Phillips has a diamond coating formed of an aggregate of secondary diamond grains, each of which includes an aggregate of primary diamond fine grains ("double crystal structure") of the present claimed subject matter.

With respect to claim 8, the Examiner at page 7 of the Office action, stated that a diamond coating formed as a single layer does not correspond with Applicants' description of the layers as a double crystal structure. The Examiner appears to misunderstand the present claimed subject matter. Applicants emphasize that there is absolutely no relation between a crystal structure being a double structure and that of forming the diamond coating as a single layer or multiple layers. Thus, the diamond coating of the present claimed subject matter formed as a single layer has a double crystal structure within the single layer. The same is true for a second diamond coating layer formed on top of the first.

The secondary reference to Fontaine fails to remedy the above argued deficiency of Phillips. The Examiner appears to rely on Fontaine as evidence that hydrogen effects diamond film structures and properties. See page 4 of the Office Action.

Dependent claims 9-13 and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Phillips in view of Fontaine and further in view of Kembaiyan et al. (U.S. Pat. App. Pub. No. 2004/0060742, hereinafter "Kembaiyan"). Applicants traverse.

Applicants incorporate herein the arguments previously advanced in traversal of the rejection under 35 U.S.C. § 103(a) predicated upon Phillips and Fontaine. The tertiary reference to Kembaiyan does not cure the argued deficiencies of Phillips and Fontaine. Kembaiyan discloses cutters for earth-boring drill bits made from a tungsten carbide and having a diamond layer covering the cutting face. It is assumed that the diamond layer is formed thick as the invention of Kembaiyan is related to the earth-boring drill bits (as shown in Figure 1 and paragraph [0005]).

It can be hardly said that a base rock subjected to cutting would require excellent work surface roughness as in the field of micro processing to which the present subject matter is related. Accordingly, it can be considered that the diamond layer disclosed in Kembaiyan has neither a surface as smooth as it is defined in the claim 1 of the present application, nor a "double crystal structure" to achieve a smooth surface. Thus, even if the applied references are combined as suggested by the Examiner, the claimed subject matter will not result. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1988).

It is believed that pending claims 1-3 and 5-16 are now in condition for allowance. Applicants therefore respectfully request an early and favorable reconsideration and allowance of this application. If there are any outstanding issues which might be resolved by an interview or an Examiner's amendment, the Examiner is invited to call Applicants' representative at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is

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hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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